

Oilseed Processing: an overview of available technologies

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Oilseed Processing

- The Oilseed Processing Industry:
 - Separates the “whole seed” into 2 or more products
 - The difference between the cost of the seed and the value of the products created is the “crushing margin”



Types of Oilseeds

■ Major US Oilseed Production

- Soybean
- Cottonseed
- Sunflower
- Canola/Rapeseed
- Flaxseed
- Safflower



Types of Oilseeds

■ Other oil producing crops

- Corn
- Peanut
- Camelina
- Palm
- Olive
- Coconut



Processing Technology

■ Two General Methods

- Solvent Extraction

- Standard technology for facilities with daily capacities of greater than 300 tons per day
- Commonly used in conjunction with some form of mechanical extraction

- Mechanical Extraction

- Typically used for facilities with daily capacities of less than 150 tons per day



Solvent Extraction

- Nearly all commercial soybean processors use solvent extraction technology



Solvent Extraction

■ The basic process:

- Seed Preparation
 - Removal of foreign objects
 - Removal of seed hulls or shells for some seeds
- Pre-Pressing
 - Seed is crushed through a mechanical press
 - Pre-Pressing removes some oil from high oil content seeds



Solvent Extraction

■ The basic process:

- Solvent Application
 - Solvent is applied to the pre-pressed material
 - The solvent bonds to the oil in the material
- Solvent & oil mixture is removed from the meal
- The oil is then separated from the solvent which is reused in the process



Solvent Extraction

■ Benefits:

- Solvent Extraction is capable of recovering of 90% of the oil contained in the seed
- Lowest cost per ton for commercial processing

■ Draw Backs:

- Large capital investment
- Not feasible for small scale processing
- Environmental concerns



Mechanical Extraction

- Oilseed processing equipment with daily a capacity of less than 5 tons is readily available.



Mechanical Extraction

■ The basic process:

- Seed Preparation
 - Removal of foreign objects
 - Removal of seed hulls or shells for some seeds
- Extraction
 - Seed is processed by a mechanical press
 - Removing 65-80% of oil contained in the seed



Mechanical Extraction

- Questions to ask to determine the right equipment capacity:
 - How many tons of oilseed do you intend to process?
 - How much time are you willing to devote to oilseed processing?



Mechanical Extraction

- Questions to ask when selecting equipment:
 - How many tons per hour (or day) can the equipment process?
 - What oil recovery rate(s) can be obtained with the equipment?
 - 65%-80% oil recovery rate is common
 - Is the equipment capable of pre-heating the seed?



Mechanical Extraction

■ Seed Preparation

- All seed will need to be cleaned prior to processing
- Some seeds require additional preparation
 - For Example: Sunflowers require dehulling
- Equipment Manufacturers can provide information on seed preparation



Mechanical Extraction

- Required Equipment
 - Mechanical Press
 - Power source for the press
 - Seed Bins
 - Meal Bins
 - Oil Tanks
 - Pumps, Filters, Plumbing



Mechanical Extraction

- Sample Oilseed Press Prices:
 - 1 TPD press without power source: \$1,000
 - 2 TPD press without power source: \$1,995
 - 5 TPD press with electric motor: \$6,000
 - 10 TPD press with electric motor: \$10,500



Mechanical Extraction

■ Installation Costs

- Do you need to upgrade your electrical system?
- Shipping Costs?



Mechanical Extraction

■ Operating Costs

- Seed
- Labor
- Electricity
- Maintenance



Example

■ On-Farm Example:

- If you plant 100 acres of canola,
- with an average yield of 1,100 lbs per acre,
- your production is approximately 55 tons



Example

■ Processing Time

- How many 12 hour shifts will it take to process your production?
 - 5 ton per day press: 22 shifts
 - Labor Cost (\$7/hr.) per ton: \$34
 - 2 ton per day press: 55 shifts
 - Labor Cost (\$7/hr.) per ton: \$84
 - 1 ton per day press: 110 shifts
 - Labor Cost (\$7/hr.) per ton: \$168



Example

- The 55 tons of seed will yield approximately:
 - 4,200 gallons of oil
 - 36 tons of meal

* Assuming: The seed has 38% oil content and press recovers 75% of the oil content in the seed.



Example

■ On-Farm Example:

- If you plant 100 acres of safflower,
- with an average yield of 800 lbs per acre,
- your production is approximately 40 tons



Example

■ Processing Time

- How many 12 hour shifts will it take to process your production?
 - 5 ton per day press: 16 shifts
 - Labor Cost (\$8/hr.) per ton: \$38
 - 2 ton per day press: 40 shifts
 - Labor Cost (\$8/hr.) per ton: \$96
 - 1 ton per day press: 80 shifts
 - Labor Cost (\$8/hr.) per ton: \$192



Example

- The 40 tons of seed will yield approximately:
 - 2,800 gallons of oil
 - 27 tons of meal

* Assuming: The seed has 35% oil content and press recovers 75% of the oil content in the seed.



Final Products

■ Meal

- The oilseed processed determines many of the attributes of the meal
- Oil content of the meal also determines some of the attributes of the meal



Final Products

■ Meal Markets

- On-Farm Use
- Local Markets
- Other Markets
 - Transportation costs may be limiting



Final Products

■ Oil Markets

- On-Farm Use
 - Bio-diesel
- Local Markets
 - Other bio-diesel manufactures
- Other Markets
 - Human Consumption



Questions



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